

Title: Rolling Averages	Version #: 1.0	Procedure #: 2.0
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Approval Authority: Bill Baumann and Jeff Hanson	Date Approved: October 14, 2005	
Key Words: rolling average, peaking plant		

AIR MANAGEMENT PROGRAM WORK PROCEDURE

Activity: Inserting rolling average requirements into permits and evaluating compliance with rolling average requirements¹

Staff Affected: Construction and Operation Permit Drafters, Compliance Inspectors, Regional Leaders, Permits and Compliance Section Chiefs

1. Background/Need

The Air Permit Improvement Initiative Traditional Permits Workgroup discussed emissions monitoring requirements with industry representatives in order to comply with the Act 118 provision to review our requirements against those imposed by other states. The calculation of rolling averages was identified as an area that needed clarification and further guidance. A variety of industry groups may be subjected to rolling average requirements including: boilers, turbines, petroleum refineries, lime kilns and polymer manufacturing. Industry was concerned about:

- the lack of consistency between staff in calculating the rolling average
- the calculation of rolling averages for intermittent sources
- the number of days of violation that might result from rolling averages
- multiple types of limits for a single emission source, and
- being able to use CEM equipment to do the calculations, rather than having to set up another recordkeeping system.

The work instructions provided below:

1. Clarify rolling average calculations associated with different rule requirements and provide example calculations for mass-per-throughput and mass-per-time limitations.
2. Clarify policy related to the number of days of violation.
3. Provide specific instructions related to intermittent sources, such as peaking plants.
4. Provide specific instructions related to limits resulting from modeling, e.g. SO₂.
5. Instruct permit writers to include rolling average calculations in the permits, so as to avoid post-permit-issuance misunderstandings about how to calculate.
6. Instruct compliance inspectors to review monitoring data against the original calculation when reviewing compliance.

¹This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

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Additional guidance on how to streamline multiple requirements for a single emission source will be developed separately, since that issue pertains to other types of requirements beyond just rolling averages.

2. Work Instruction

2a. Job Title: Construction and Operation Permit Drafters

Permit drafters are responsible for:

- a. Ensuring that rolling average calculations and the legal authority upon which the rolling average limitation is based are clearly defined in the permit. See Attachment B for permit language examples.
- b. Discussing the rolling average calculation with the permittee and compliance inspector prior to permit issuance, to ensure that all parties have a common understanding of how to calculate.
- c. Ensuring that limits resulting from modeling, e.g. SO₂, are expressed as a mass-per-time limit. If a facility prefers to calculate using production data in a mass-per-throughput calculation, this is acceptable provided the units of throughput can be readily translated into a mass-per-time emission rate. In either case the specific calculation should be clearly defined in the permit. See Attachment B for example language.
- d. Rolling averages for intermittent sources such as peaking plants have evolved over the years from Mass-per-time to Mass-per-output basis. When incorporating older construction permit limits into an operation permit, the permit drafter should discuss options for updating the limit with the facility. These limits may be updated by permit revision if there will not be an emissions increase as a result of the change. Changes to longer averaging times typically result in potential emission increases and require a permit modification. Example language is provided in Attachment B.
- e. For peaking plants, problems might arise in maintaining compliance with the emission limit during startup/shutdown. One possible solution is to include one limit for startup/shutdown and another limit for normal operation; this solution should only be used for BACT limits, however. This does increase the monitoring/recordkeeping burden for the facility. Unless the permit specifies separate limits for startup/shutdown periods, the permit should state that startup/shutdown period emissions must be included in compliance demonstration calculations and reporting
- f. For situations where there are multiple requirements for a single emission source, permit drafters should refer to the guidance on streamlining multiple requirements to see if they can reduce the number of limits. This guidance is scheduled to be completed during the Fall 2005.

2b. Job Title: Compliance Inspectors

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Compliance inspectors are responsible for:

- a. Reviewing compliance data submitted by facilities against the calculation defined in the permit.
 - b. For those situations where existing permits do not contain the specific calculations, compliance inspectors should go back to the original BACT determination or other permit documentation to find the originally agreed upon calculation. They should use this calculation when interpreting data submittals.
 - c. For those situations where the originally agreed upon calculation is not documented in the files, the compliance inspector should ask the facility to provide the calculation method and compare it to this guidance. If it conforms to this guidance, the compliance inspector should notify the facility that this calculation method is appropriate and should document the calculation and plate it in the operation permit file, so that the calculation is available to the permit drafter when the permit is either revised or renewed.
 - d. In either of the two above situations, if the calculation method doesn't seem appropriate, compliance inspectors should discuss with Test Method Specialist.
- 2c. Test Method Specialist** is responsible for providing technical assistance as requested by compliance inspectors and permit drafters.

3. Training Requirements

All staff and managers affected by this work procedure should familiarize themselves with the information provided in this work procedure.

4. Facility Requirements

Facilities are responsible for identifying emission limitations and averaging periods in their Title V operation permit applications. For very low limits, the facility should understand the implications of a limit with very little "wobble room." This same approach holds true for other situations such as synthetic minor proposals or modeling based solutions.

Facilities should identify situations where there are multiple requirements for a single emission unit to their permit drafter who will assist them to determine if requirements can be streamlined.

Facilities should familiarize themselves with the legal authority upon which their rolling average limit is based and understand which calculation they are to use to determine compliance.

5. Legal and Other Requirements

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Rolling average requirements can be found in both Federal and State rules. Specifically, they are currently located in the following Wisconsin rules: NR 406, 407, 415, 417, 420, 428, 439, 440, 463, 466 and 469 Wis. Adm. Code (WAC). Rolling average requirements occur as applicability statements, input thresholds, output thresholds or reporting requirements. They are generally listed as conditions of an air pollution control permit as emission limits or caps (e.g. 2,000 gallons per month, based on a 12-month rolling average).

Eight exclusive rolling average requirements are listed in the Federal and State rules. Specifically they include; 24-hour, 3-day, 7-day, 14-day, 30-day, 3-month, 6-month and 12-month. The most prevalent are 24-hour, 30-day and 12-month.

The applicable averaging period and subsequent monitoring data elements can be subject to specific rule definitions (see attached spreadsheet). For example, the “process per operating day” definition can require the combustion of fuel for a portion of the operating day or an entire twenty-four hours. The “pollutant per hour” definition can dictate the frequency of sampling and the minimum number of valid data points.

Applicable rules and permits can allow exclusionary periods. A facility may or may not exclude startup, shutdown and malfunction periods from the rolling average based upon the method that is dictated in the permit. Before calculating any rolling average, one must understand the applicable underlying rule definitions and monitoring requirements.

See spreadsheet and examples in appendix for more information.

e. Number of days of violation

No more than one day of violation should be alleged for each 24 hours of valid data, regardless of the number of days over which those valid hours are accrued. For purposes of determining the number of days of violation, 24 hour blocks of valid data should not overlap, and an hourly emission rate should only be included within one 24 hour period. For example, if it takes 3 calendar days to accrue 24 hours of valid data, that is still only ONE day of violation.

6. Records

Permit engineers will document the averaging calculation in the permit. Compliance inspectors will document the use of the appropriate averaging calculation in compliance inspection reports.

7. Work Procedure Implementation/Verification

7a. Regional air supervisors: Regional air supervisors are responsible for ensuring that their staff::

- 1) Identify the legal authority for the rolling average limit and the appropriate averaging calculation in the permit.

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- 2) Evaluate compliance according to the appropriate calculation. (This applies mainly to compliance inspections.)
- 3) Resolve conflicts between permit drafters, compliance inspectors, and regulated facilities in terms of how the average is to be calculated.

7b. Compliance and Enforcement section chief is responsible for ensuring that the test method specialist provides timely, consistent, and accurate information to permit drafters and compliance inspectors.

7c. Permit and Stationary Source Modeling section chief is responsible for ensuring, as part of their periodic permit review, that the legal authority for the rolling average limit and the appropriate averaging calculation are identified in the permit.

8. Supporting Documentation

Links to spreadsheets
Links to appendices

9. Revision History

Version #	Reason for Change	Date Approved

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Attachment A: Mass-Per-Throughput and Mass-Per-Time Calculations

It is relatively simple to calculate rolling averages for processes operating continuously, equipped with continuous parameter or emission monitoring systems and without site-specific allowable exclusionary periods. Conversely, processes operated intermittently, equipped with infrequent parameter or emission monitoring systems and allowable exclusionary periods make the calculation procedure considerably more challenging.

Rolling averages are calculated two distinctive ways depending on the underlying reporting unit or emission limit unit. For example, reporting units and permit emission limit units can be established on a **mass per throughput-basis** or **mass per time-basis**. Examples of mass per throughput-based reporting limits and permit emission limits include, but are not limited to: lb/mmbtu, lb/ton, lb/gallon, lb/lb, kg/Mg, etc. Examples of mass per time-based permit emission limits include, but are not limited to: lb/hr, gallons/month, lb/yr, tons/hr, weight-rate, etc.

Mass per throughput-based reporting limits and permit emission limits presume the process is operational. Any numerator divided by zero will always be zero. Therefore, we can only accrue data when the process is operating. The following is an example of how to accrue continuous emission monitoring (CEM) data if the unit has a **mass per throughput-based permit emission limit** and is utilizing the CEM for compliance demonstration purposes (NR 439.09(10) has already established a 24-hr rolling average and excess emission periods):

Data accrual - for twenty-four hourly averages, the process must be operating during a portion of each valid hour to be included in the average, excluding zeros and *BACT startup and shutdown emissions (i.e. 18-24 1-hr averages accrued over 36 total hours - process not operating continuously excluding zeros and *BACT startup and shutdown emissions). [see examples 1-3]

Excess emissions - an exceedance of a 24-hour rolling average generates one 18-24-hour exceedance the first time. Additional hours of exceedance are accrued at one-hour intervals only when the 24-hr rolling average is exceeded, the process must be operating during a portion of each valid hour to be included in the average, excluding zeros and *BACT startup and shutdown emissions (i.e. 18-24 1-hr averages accrued over 36 total hours - process not operating continuously excluding zeros and *BACT startup and shutdown emissions could generate 18-23 hours of exceedance). Exceedances accrue in 18-24 hour blocks resulting in typical exceedances of 23, 47, 71. [assumes at least 1-hr for *BACT startup and shutdown]

** Startup and shutdown periods are listed as a separate category of excess emissions, however, some PSD permits have specific startup and shutdown emission limits which exclude them from inclusion in the 24-hr rolling average. The overall amount of a startup or a shutdown is process specific and should be listed in the permit for enforceability. For purposes of reporting exceedances on the basis of a 24-hour rolling average under subsection NR 439.09(10)(c), WAC, any hourly average may be included in only one 24-hour period. An exceedance shall be based on at least 18 and not more than 24 valid recordings of hourly average emission rates in any 24 hour period.*

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Mass per time-based permit emission limits, as the name implies, assume a loading of mass over a unit of time. In this case we would include periods of time when the unit was not operating. The following is an example of how to accrue CEM data if the unit has a **mass per time-based permit emission limit** and is utilizing the CEM for compliance demonstration purposes (NR 439.09(10) has already established a 24-hr rolling average and excess emission periods):

Data accrual - for twenty-four hourly averages, regardless of whether the process has operated continuously excluding *BACT startup and shutdown emissions (i.e. 18-24 1-hr averages in a 24-hr day including zero hourly averages but excluding *BACT startup and shutdown emissions - typically one 24-hr average per day). [see examples 4-5]

Excess emissions - an exceedance of a 24-hour rolling average generates one 18-23-hour exceedance the first time, the specific 24-hr block of data is removed and reported as a 18-24-hr exceedance (similar to a VE exceedance utilizing 24-points of data). A new 24-hr rolling average begins and additional hours of exceedance are accrued at 24-hour intervals only when the 24-hr rolling average is exceeded, regardless whether the process has operated continuously excluding *BACT startup and shutdown emissions (i.e. 18-24 1-hr averages in a 24-hr day including zero hourly averages but excluding *BACT startup and shutdown emissions could generate 18-23 hours of exceedance). [assumes at least 1-hr for startup and shutdown]

** Startup and shutdown periods are listed as a separate category of excess emissions; however, some PSD permits have specific startup and shutdown emission limits which exclude them from inclusion in the 24-hr rolling average. The overall amount of a startup or a shutdown is process specific and should be listed in the permit for enforceability. For purposes of reporting exceedances on the basis of a 24-hour rolling average under subsection NR 439.09(10)(c), WAC, any hourly average may be included in only one 24-hour period. An exceedance shall be based on at least 18 and not more than 24 valid recordings of hourly average emission rates in any 24 hour period.*

The subsequent flowcharts have been included to help illustrate rolling average calculations. They comprise examples utilizing mass per throughput-based limits, mass per time-based limits, routine maintenance and quality assurance activities and exclusionary periods.

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Attachment B: Example Permit Language

Following are some examples of permit language *These example “short term” averages all assume the use of CEM, however there are several instances where time based averages are not supported by CEMs but by material or fuel use. Do we need to address non-CEM situations other than the 12 month situation?:*

(1) To comply with the 3-hour rolling average (pound per million BTU) emission limit, the permittee shall compute, using data obtained from the continuous emissions monitoring system, hourly emission averages from 4 data points equally spaced over each 1 hour period, except during periods when calibration, quality assurance or maintenance activities are being performed. During these periods, a valid hour shall consist of at least 2 data points separated by a minimum of 15 minutes. The average of 3 successive recorded valid hourly emission averages shall be recorded as the 3-hour rolling average. [For pound per hour averages]The emissions recorded over 3 successive valid hours shall be totaled and divided by three to obtain the 3-hour rolling average.

(2) To comply with the 24-hour rolling average mass per unit throughput emission limit (e.g. pounds per ton or pounds per million BTU), the permittee shall compute, using data obtained from the continuous emissions monitoring system together with production records of the throughputs, hourly emission averages from 4 data points equally spaced over each 1 hour period, except during periods when calibration, quality assurance or maintenance activities are being performed. During these periods, a valid hour shall consist of at least 2 data points separated by a minimum of 15 minutes. The average of the valid hourly emission data points over any 24 successive operating hours shall be computed to demonstrate compliance with the 24-hour rolling average emission limit. There shall be at least 18 valid hour emission data points included in each 24-hour rolling average period. **[Note:** In this scenario, an emissions unit that operates one 8-hour shift a day will need to have 3 days of operation to get to the 24-hour mass per unit throughput data. This may also be complicated by the fact that in certain situations, periods of start-up, shutdown and malfunction are excluded from the computation.]

(3) To comply with the 24-hour rolling average mass per time (e.g. pounds per hour) emission limit, the permittee shall compute, using data obtained from the continuous emissions monitoring system, hourly emission averages from 4 data points equally spaced over each 1 hour period, except during periods when calibration, quality assurance or maintenance activities are being performed. During these periods, a valid hour shall consist of at least 2 data points separated by a minimum of 15 minutes. The average of the valid hourly emission data points over any 24 hour-period shall be computed to demonstrate compliance with the 24-hour rolling average emission limit. There shall be at least 18 valid hour emission data points included in each 24-hour rolling average period. **[Note:** In this scenario, hours when there is no operation are counted as valid hours so that an emissions unit that operates one 8-hour shift a day will need to have 16 hours of zero emissions counted towards the 24-hour mass per time computation. This may also be

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complicated by the fact that in certain situations, periods of start-up, shutdown and malfunction are excluded from the computation.]

(4) For the rolling 12 month average, as defined in NR 400.02(140), calculations (the same "in any 12-consecutive months" in some permits) for limitations on throughputs (like crushers, asphalt plants, fuel combustion, and so on) to avoid major source applicability:

To comply with the throughput limitation based on a 12-month rolling average (or in any 12-consecutive months), the permittee shall compute the monthly throughput as follows: (an example with fuel oil usage is presented here)

In the first month after initial operation (permit issuance), the monthly average fuel oil usage shall be the actual fuel usage for that month, in gallons, not to exceed xxxx gallons. After the second month, the average monthly fuel oil usage shall be the sum from the previous two months divided by two, not to exceed xxxx gallons. After the third month, the average monthly fuel oil usage shall be the sum from the previous three months, divided by three, not to exceed xxxx gallons. This procedure shall be followed through the 12th month. From the 13th month and beyond, the average monthly fuel oil usage shall be the total fuel usage from the previous 12 consecutive months, not to exceed xxxx gallons per month based on the average of the previous 12 consecutive month period.